

Additionally, a serious question arises as to the method to be employed in transmitting signals to the 12 GHz transmitters. As there is already an acute shortage of microwave frequencies available for auxiliary broadcast use, it is very doubtful that sufficient spectrum would be available for transmitting program material to the many 12 GHz transmitter sites. Due to the required bandwidth, the signals could not be delivered over existing telephone circuits. The complicated distribution network required would, even if possible to implement, impose a large cost burden, whether a microwave system or a land-line cable system is constructed.

Receiving Location Difficulties

Frequencies near 12 GHz exhibit vastly different propagation characteristics than do the frequencies now employed by television stations. While television reception is generally possible in the residential neighborhoods of a given market with set-mounted indoor antennas, terrestrial 12 GHz reception would require a line-of-sight path between the transmitting antenna and the receiving antenna. The receiving antenna would generally have to be mounted above tree-top level, as shown in Figure 2, for satisfactory reception. In areas of rugged terrain, it would be impractical to provide 100 percent coverage with even higher receiving antennas due to the large number of shadows produced by terrain features. In the CBS study, it was quite correctly observed that "very little, if any, diffraction around

obstacles, or penetration through obstacles -- including foliage -- was noted." Line-of-sight is essential for satisfactory reception.

In addition to receiving antenna clearance above trees and other obstacles, the orientation of the antenna would be critical due to its directional characteristics. A rigid receiving antenna installation would be necessary to maintain stability and reduce sway, thereby requiring a substantial structure to support the receiving antenna. If the 12 GHz transmitter locations are not identical for all of the stations in a market, receiving antennas would have to be mounted on rotators capable of precise, repeatable orientation settings.

Rain attenuation at 12 GHz is a very severe problem for terrestrial microwave links. Even for satellite links where the path length through the rain is only of the order of about one mile, the rain attenuation can exceed 10 dB. For terrestrial links where the path length can be of the order of 10 to 20 miles, the expected path attenuation for rain can be expected to exceed many tens of decibels. Such loss is not easily or inexpensively overcome by use of high power transmitters.

The receiving difficulties at microwave frequencies, such as 12 GHz, are acceptable for fixed point-to-point terrestrial circuits, where propagation paths are carefully planned, and expensive, permanent and extremely rigid antenna installations are typical. It is

not reasonable, however, to expect members of the general public to cope with complicated and expensive receiving systems at millions of home installations.

Additionally, there would be considerable visual clutter in the typical suburban neighborhood with antennas at each home supported on structures tall enough to clear tree-top level. The Commission is aware of the local zoning difficulties faced by radio amateurs and others who attempt to construct antenna towers in local neighborhoods. The environmental and aesthetic zoning concerns would be formidable.

It should be noted at this point that, even though terrestrial reception of 12 GHz signals poses serious difficulties and requires expensive supporting structures, the band is well suited for the purpose allotted for it, Direct Broadcast Satellite service, where the propagation path is essentially vertical. In DBS service, the signals arrive from satellites rather than from transmitters located on the surface of the earth. Relatively inexpensive DBS receiving equipment, with antennas mounted on building roofs or at ground level (between trees) may be employed as long as line-of-sight exists to the satellite.

Conclusion

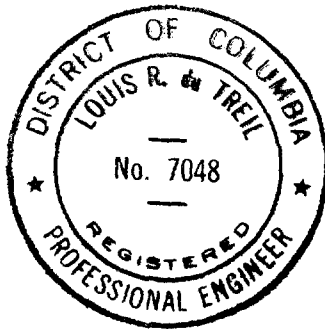
As has been shown, many of the assumptions of AMST which led them to conclude that 12 GHz frequencies

might someday be usable for terrestrial transmission of HDTV signals are incorrect. For the spectrum at 12 GHz that they wish to make available for this purpose, it appears from the assertions of CBS, a company which has experimented with terrestrial 12 GHz transmission, that much less service could be provided than was assumed by AMST since the AMST bandwidth estimates did not take into account the mode of transmission which would be required for satisfactory performance. AMST also badly underestimated the number of cells which would be required to provide equivalent area coverage in the 12 GHz band. There are many practical problems with the transmitting and the receiving antennas and equipment which would be required to implement a system such as the one envisioned by AMST.

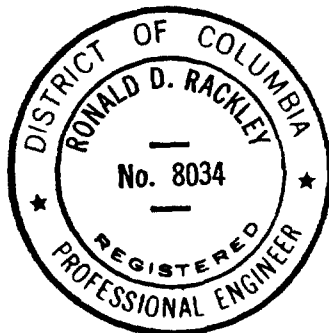
It must be remembered that AMST is only guessing about what might be possible in the future, as there exists today no proven system for the transmission of NTSC compatible HDTV. The problems with terrestrial 12 GHz transmission, many of which have been explained herein, are well known. Frequencies in this range are much better suited for DBS service than for terrestrial service. The Federal Communications Commission has recognized this and has assigned the frequencies from 12.2 GHz to 12.7 GHz exclusively to the Broadcast Satellite service.

As has been shown, use of 12 GHz frequencies to augment the spectrum of terrestrial broadcasters, permitting them to transmit HDTV, is simply not

practical. The propagation and reception problems alone doom the idea. In addition, there does not even appear to be enough spectrum available to meet AMST's needs and still leave anything for a regular DBS service. It is the professional opinion of the undersigned that the 12 GHz DBS frequencies in question are not suitable for the terrestrial supplemental HDTV service envisioned by AMST.



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/1AMST Petition For Special Relief, footnote 4, page 6.

/2AMST Petition For Notice of Inquiry, page 14.

/3Comments of CBS, Inc. in support of Petition For Notice of Inquiry and Petition for Special Relief, February 24, 1987, footnote on page 7.

/4AMST Petition For Notice of Inquiry, footnote 12, page 30.

Certificate of Service

I, Linda K. Petteway, a secretary to the law firm of Fisher, Wayland, Cooper and Leader, hereby certify that I have, this 10th day of June 1987, sent by first class United States mail, postage prepaid, copies of the foregoing "Comments of Hughes Communications Galaxy, Inc., on 'Petition for Notice of Inquiry'" to the following:

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